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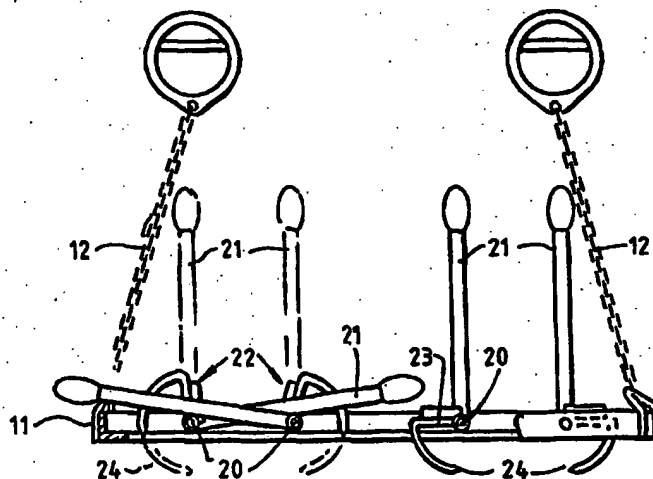
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(71) Applicant (for all designated States except US): STRATHAYR PTY. LIMITED [AU/AU]; Tallarook Park, School House Lane, Seymour, VIC 3660 (AU).		Published With international search report.	
(72) Inventors; and (75) Inventors/Applicants (for US only): CASIMATY, Gabriel, Bill [AU/AU]; Tallarook Park, School House Lane, Seymour, VIC 3660 (AU). SIMONIS, Lee, Andrew [AU/AU]; Tallarook Park, School House Lane, Seymour, VIC 3660 (AU).			
(74) Agent: A. TATLOCK & ASSOCIATES; 21 Queensberry Street, Carlton, VIC 3053 (AU).			

(54) Title: TURF PRODUCT METHOD AND HANDLING



(57) Abstract

The invention relates to a turf product being in the form of an extended slab comprising a growing medium of substantial thickness to provide a root zone, the growing medium being sand and/or soil, turf established on the surface of the growing medium and with the roots thereof extending into the root zone characterized in that the combination of the roots and the root zone material and the thickness of the growing medium is such that the slab is consolidated and has a degree of structural rigidity so that it is possible to handle the slab without any form of support of its base. Reinforcing material in the form of small plastic mesh may be located in the growing medium. The product may be lifted from at least a number of positions over its area by a grab (10) having tines (22) which can be brought into contact with the surface of the slab and it may be used to replace worn areas in racecourses and sports arenas. The slab may form part of a removable cricket pitch.

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TURF PRODUCT METHOD AND HANDLING

This invention relates to a turf product, methods for its manufacture and means whereby it can be readily handled, both during the growth stage and later.

In our previous patent application No. PCT AU93/00565, we have described a turf product, which will normally be in the form of a square or rectangle and, in that patent application, we described methods of manufacture and methods of handling the product.

The main feature of this product, and what separated it from conventional "instant turf", that is turf harvested with a quantity of root mass in a root zone material, and which can be re-located, was that it included a substantial root mass in a growing medium. By providing such a product, this could be located on the ground surface and effectively be used immediately, even where the product was to bear substantial stress, such as on football fields. This was partly achieved because the root mass itself was fully embedded into the root zone material and partly because of the overall mass of the product. This was in distinction to normal instant turf which is thin relative to its surface area, is laid over a prepared surface, and is not useable until the root system has grown into the surface.

This invention relates to similar products which can be used, for example, to replace worn areas of turf in, say, a playing

field. The product can also, if required, be laid to cover a surface, either permanently or temporarily.

The objects of the invention are to provide a form of turf product which can be handled more readily than previously known products, new methods of handling such products, including apparatus for handling and new methods of making the products.

In the first aspect of the invention, we provide a turf product being in the form of an extended slab comprising a growing medium of substantial thickness to provide a root zone, the growing medium being sand and/or soil, turf established on the surface of the growing medium and with the roots thereof extending into the root zone characterised in that the combination of the roots and the root zone material and the thickness of the growing medium is such that the slab is consolidated and has a degree of structural rigidity so that it is possible to handle the slab without any form of support of its base.

It is preferred that a reinforcing material be located in the growing medium. This can be in the form of small plastic mech elements, such as those sold under the trade mark "Netlon" or fibrous material, such as that sold under the trade mark "Turf Grids". All description of slabs, unless specifically stated, will include both reinforced and un-reinforced material.

Prima facie, this product appears similar to that of our earlier PCT application, cited above, but, from a practical point of view, the product is a substantial improvement. Previously accepted knowledge was that any large area of turf which incorporates a substantial quantity of growing medium would have to be supported in some way, and, for that reason, until the proposal in our earlier application, there were no seen applications for such a product.

In our earlier application, we proposed the use of slabs of a turf product which was supported on a pallet type base and was removed therefrom by sliding the slab off the base to its required position. This product has been most satisfactory in use but has disadvantages. The major one of these is that, to a large degree, the placing of the product, once it begins to move from the pallet is irrevocable. The product is very heavy and, in itself does not have the structural strength to accept extensive loads. Thus, unless the product can be returned to the pallet, it must be located where it is placed and, if necessary trimmed or filled to cover the required area.

In another aspect of the invention, we provide a method of growing turf where there is little or no drainage under which the quantity of moisture and nutrients are so controlled as to ensure that the root mass of the turf is spread through the whole of the growing medium.

In a still further aspect, we provide a method of handling a turf product in the form of a slab comprising providing means to apply a lifting force to the upper surface of the slab at at least a number of positions over the area of the surface of the slab which are located so the slab can be lifted without tending to break because of unacceptable forces at any part of the slab to thereby enable movement of the slab as a whole and delivery of the slab to a required position, removing the lifting forces leaving the slab at the required position.

In a still further aspect of the invention we provide a method of handling turf slabs which comprises inserting into the slab a number of support members which are or can be moved to a position away from the normal of the slab, these members being associated with a frame or the like whereby the slab can be raised and otherwise handled.

In a still further aspect of the invention we may locate the slabs on any required surface as will be described hereinafter. In a further aspect of the invention, where the slabs are to be located on a pre-existing surface we may provide edge members which could be in the form of a concrete edging or the like and which may have means whereby it may be connected into the side of the slabs.

Also, in accordance with the invention, we provide tools to lift slabs of turf material which include members which can enter into the slab from the upper surface thereof and which

can each bear portion of the weight of the slab.

In order that the invention may be more readily understood we shall describe more fully the various aspects of the invention.

Reference will be made to the accompanying drawings, in which:

Fig 1 is a perspective view of the grab used with the invention, showing it located on a fork lift tines;

Fig 2 is a side elevation of the grab showing the general arrangement of the tines;

Fig 3 is a plan view of the grab showing the location of the tines; and

Fig 4 is a schematic side elevation of an alternative form of grab mechanism.

In our previous PCT application, referred to hereinbefore, we discussed methods of manufacturing slabs of turf and of handling these slabs, and as further development work has proceeded we have found that the applications for such slabs could be very much greater than previously anticipated, so it became necessary to provide more sophisticated methods of production and handling.

MATURING

It will be appreciated that when the slab is to be used it is necessary that it be kept as close as possible to its initial shape.

If the slab is located on a pallet, and is to be maintained on the pallet for use, the pallet can then simply be taken to a position at which slabs are held whilst the turf is permitted to grow and become mature.

This is, however, a relatively expensive procedure, as the pallets are in use for a period of a minimum of two months, whilst maturing takes place, and up to six or twelve months or even more before the slab is used and we prefer to hold the slabs during this period in a cheaper manner.

This can be done in two ways. The first can simply be to provide a flat concrete area which can be of a size to hold the requisite number of slabs, possibly several hundred or thousands of these. If such an arrangement is to be used a flat plate may be used as a support for the slabs as they are being located on the area, the slab and plate are taken to the required position, the slab is located and the plate is removed.

The slabs, even after initial formation, are relatively coherent and, in a preferred application, we may locate the

slab adjacent others on the area by means of a lifting grab which may include multiple spiked anchors which can be passed into the top of the slab to both move the slab and to hold the slab whilst the plate is being removed from there beneath.

The third method of maintaining slabs would be to simply provide a flat area such as in a paddock, which may be sand covered, and on which the slabs are located.

We mentioned earlier herein that we may use a plastics material or the like around the periphery of the slabs after formation. When they are maturing and are closely adjacent, and in many applications it is desirable that the roots do not pass from one slab to an adjacent slab. Plastics film makes a barrier but we could also use re-useable sheet metal strips or even waterproof cardboard. It may be desirable that the material be coated or impregnated with a root pruning chemical to inhibit movement between the slabs.

In the first application, once the slabs are matured they can simply be handled by a forklift, in the second application we can use handling means as will be described later herein, and in the third application we may have to effectively "harvest" the slabs by using a harvester set at a depth to pass between the lower surface of the slab and the surface of the sand it will be appreciated, under normal circumstances, that the roots will pass through the slab and into the sand.

This is not particularly desirable, so we may provide a mesh or the like on the surface on which the slabs are located, or possibly a mesh some distance below the surface. This will be described further hereinafter as the mesh itself causes a problem on effective water table heights it may be that this can be used to the benefit of the slab.

Whilst the slab is becoming mature, it is preferred that the growing root mass passes effectively through the whole of the growing medium and even that it breaches through the bottom of this and moves outwardly along the bottom of the slab to provide a strongly coherent mass.

We indicated above that there were applications where a false (or perched) water table can be formed and, under most circumstances, this is most undesirable as the roots will not pass through this water table, they will simply rot off. There is one application, however, where we can make use of a perched water table to control the product.

This is a phenomenon which is known. For example, where sand or soils of a different particle size meet, there can often be established a water table even though it might be expected that the water would move through this junction.

Where the slabs are on a surface, such as a pallet top, even though this may be perforated we can find such a perched water table and thus the lower part of the slab can be wet.

Where the slabs are being grown on concrete, then there is no drainage, except around the edges, and, as we have mentioned there may be a very substantial number of slabs on the same area of concrete so drainage cannot be properly effected.

Also, as we have mentioned, where the slabs are on a sand surface there may be such a perched water table and certainly where there is a mesh there will be such a water table.

The invention can be applied in a different manner and that is, the turf could be planted on a field or on a concrete slab in a relatively conventional way. This turf can be permitted to mature, preferably using nurturing techniques as described hereafter and when the slabs are required they are formed from the matured turf. That is, if the turf is in a field, normal harvesting techniques can be used with the width of the turf being the required width and the turf then cut into slabs of the required size.

If required, whether the turf is grown in a paddock or on concrete, or if the material is "stored" on either of these, the slabs can be cut by a saw.

NURTURING

Another aspect of this invention is a method of nurturing slabs done in this way to ensure that they reach their required condition at maturity.

This is done by monitoring the moisture close to the bottom of the slabs.

We do prefer to monitor both moisture and nutrient level because, if fertilisation is too high, and the turf does not use the nutrients then there will be a build-up of salts adjacent the bottom of the slabs as this can not only be detrimental to the slabs but also involves an expense which is unnecessary as the nutrient is not all being used.

We thus prefer to monitor both moisture and conductivity, which is a measure of nutrient content, close to the bottom of the slabs.

As far as moisture is concerned, during the summer growing season should there be substantial rain, then the moisture value will increase substantially and it is possible simply by reducing further watering to permit the excess moisture to be taken up by the roots and transpire through the leaves until the required level is achieved, at which time selective watering can be re-commenced.

At the same time, the nutrient can be monitored to ensure that fertilisation is applied in an optimal manner.

During the winter, in Victoria, or the rainy season anywhere, it may be preferred to cover the slabs to prevent excess water from being passed thereto and to control the water either by

irrigation or selective removal of the covers to maintain the required moisture in the slabs.

In respect of growing the turf on slabs on a sand base, where the sands are compatible there will be draining through the slab to the base, so this will not be essential but, as mentioned previously, under these circumstances the roots can grow through into the base necessitating a subsequent harvesting operation.

Also, under these circumstances, unused nutrients can pass through to the base thus causing a loss of nutrients, and a corresponding increase in costs and, further, this can be environmentally unsatisfactory if this means that excess nutrients go to the natural water table and are delivered, say, to the waterways.

If we place fabric over the sand surface then we tend to build up a perched water table above the fabric and, in order to overcome the disadvantage of this, the area has to be treated in the same way as discussed above where the slabs are placed on a non-draining surface.

By strictly controlling the moisture, and the nutrients, we can maximise growth and, more particularly, can maximise the matting of the root mass to ensure that the slab can be handled readily.

This normal difficulty of unwanted perched water tables can be used to effect root "pruning", by deliberately providing a water table. In one further aspect we locate the fabric below the sand level so as to deliberately form a perched water table which terminates at a required position, specifically at the junction of the surface and the slab.

In this way the root mass of the slab will effectively be pruned by the water table and not extend into the surface, and will rot off because of its moisture content. Thus there is little or no root movement across the junction, and, rather than having to harvest the slabs, as discussed above, we may simply be able to lift these as they are not bound or at least not bound substantially to the sand.

We also provide another arrangement which gives a very similar result. In this form, there is a sheet, or as described hereafter, two sheets of a material, preferably a plastics material, on which the product is grown. These sheets can be perforated, and the perforations can normally be in register.

The size and number of perforations can vary widely. As an indication, they could be as small as about 1 centimetre in diameter and as large as 10 centimetres, or larger and, preferably, they are reasonably spaced.

When the slabs are grown, the arrangement restricts the root growth as roots can only pass through the apertures, but does

permit draining. When the slab is to be lifted, it may be possible to do this without taking any further steps as the roots are restricted and these may simply break on lifting.

In each of the two above cases, if it is necessary to cut the roots, it is possible to slightly lift the slab from one side thereof and by the use of a blade or the like, cut the roots.

Where we use the sheets, and these may be flexible or semi-rigid, of plastics, these can also be associated with a perched water table if required. The blade can pass between the layers and provide a clean cut of the extending roots at the bottom of the slab. After lifting, the sheet of plastic on the underside of the slab can be removed.

HANDLING

As has been described herein before the mature slabs have considerable integrity and strength and can be handled without any great tendency to break.

We have found that handling is readily easily achieved by locating a frame over at least a substantial part of the upper surface and having passing from the frame into the surface of the slab holding members that are at an angle to the surface.

In the simplest form, we can use a ground anchor arrangement in which the frame has apertures to receive a number of anchor

rods at differing angles to the surface of the slab.

These rods are passed into the surface of the slab and then the frame can simply be lifted, lifting the slab therewith and, if it is used with a central hanging point, normally with chains or the like extending outwardly to each corner of the frame. Alternatively, we could use two hanging points, such as the tines of a fork lift. We would then use two chains, each connected between two adjacent corners of the frame. Using such an arrangement, the moving and handling of the slab is basically simple.

The preferred form of grab illustrated in Figs 1 to 3 has a frame 10, which is effectively a steel space frame and which in a preferred form has lifting lugs 11 at each corner thereof. In the illustrated form, chains 12 are each connected to a pair of the lugs 11 and each chain has an eye adapted to be received on a fork lift fork. Alternative arrangements can be made for different methods of lifting, say a single boom of a front end loader or mobile crane.

Mounted across the frame 10 there are a number, in the preferred embodiment 4, rotatable rods 20. There are mounted, adjacent each end, to the frame.

Each rod 20 is provided with an arm or handle 21 by means of which it can be partially rotated.

Alternatively, we may provide a mechanical or hydraulic means for the rotation of the rods.

Connected to each rod there are a number, in the preferred embodiment 5, tines 22 each of which has a stand-off portion 23 and arcuate portion 24. The stand-off portions 23 are substantially equal in length to the radius of the arcuate portions 24.

This arrangements permits the tine to be brought into contact with the surface of the slab and, when rotated, is enters the slab in an arc and so there is little or no damage to the slab, only a track which is similar in form to the shape of the tine.

In our preferred construction the tines 22 connected to one rod may be adapted rotate at 180° to those of the adjacent dor. This, when located, the sets act to prevent movement of the slab transversally and thus the slab is locked.

In operation the frame 10 is placed onto the slab, the lever arms 21 are each rotated so that the associated tines 22 enter the slab, rotation is continued till the arms 21 are close to being in proximity with the slab and then the frame can be lifted by the chains 12 being attached to a fork lift or other prime mover.

The form of grab schematically illustrated in Fig 4 has a

frame 30 and a number of straight tines 33. As illustrated, these are in pairs and, although not shown, there may be a number of tines across the depth of the grab. The tines in adjacent rows may be in alignment, or could be offset. Any such arrangement can be satisfactory.

The tines are pivotally connected to the frame.

In this embodiment, instead of using chains, we may have sub-frame 31 which can be connected to a boom or the like. The arrangement is such that the tines can be forced into the surface of a slab, either by downward pressure on the grab, or by the use of an hydraulic hammer or the like, which is not illustrated.

Once the tines have been embedded, outward pressure is applied to the tines, as at 34, causing the tines to turn inwardly and this provides the frictional resistance to permit the frame, and the slab to be lifted.

Both of these arrangements enable, firstly, individual slabs to be readily lifted from the surface upon which they are located and when, say, a surface is being laid the slabs can be accurately positioned prior to being placed on the ground, and, even if they are not correctly placed, they can be readily lifted and replaced to be in a correct position.

Also, use of a grab of this type can permit ready handling of

a number of slabs. For example, slabs for transport, can be individually lifted onto the surface of a tray of a truck or a trailer and can be stacked several slabs high, so that the truck or trailer can move its maximum allowable vehicle weight of slabs, thus providing economical transport costs.

When the vehicle is to be unloaded a similar grab is connected to the individual slabs, they are lifted therefrom and either stored or may directly be located in their final required position.

THE USE

The use of the method of growth of the invention together with this ready handling makes it economically feasible to actually surface substantial areas with slabs of this type with the areas being available for use effectively immediately.

Thus, should a bowling club, sports arena or even race course require resurfacing, the surface can be prepared with a simple flat sand surface, over a suitable drainage system, and civil engineering contractors using laser levelling can do this very readily, and then the turf slabs, as described earlier, can simply be laid thereon by the use of the handling method just described and the surface is basically available for use immediately on completion of the laying operation.

It is only a very short period indeed before the roots pass

into the underlying sand and the slab becomes effectively integral with the base.

However, in high wear areas, it is relatively easy to replace individual or groups of turf slabs with new slabs. For one arena in Melbourne, we carry at all times a number of slabs which can simply be used to replace areas of specific wear. Such areas can occur in high use parts of the arena, such as the goal mouth in football games or, say field areas in athletics arenas.

As an alternative to this, we can provide a "share-the-wear" arrangement whereby individual slabs can be taken from areas of high use and be replaced by slabs from areas of little use.

This can be desirable for two basic reasons. Firstly, the slabs are basically the same and have been held in the same environment. Thus, once the root systems pass into adjacent slabs, and the worn slab rejuvenates itself, it will be near impossible to tell one slab from the other.

Secondly, the slabs are more expensive than normal turf and the possibility of simply changing their position and re-using them can be commercially attractive.

Also, it will be seen that the use of the methods and apparatus of the invention can provide a fully usable temporary surface to be laid in a minimal time and for the

surface to be then be removed to permit the original surface to be achieved. For example, there has been substantial publicity about the endeavours to provide an indoor grass stadium for soccer in the U.S.A. but the use of the various concepts of the invention would permit a synthetic surfaced stadium to be grassed in a very short time, by the use of the maintenance methods described herein. This grass could be kept at its optimum condition for whatever period is required, and at the end of this period could be readily removed to permit the original surface to be used.

The invention can be very useful where a particular turfed area is to used for alternate purposes.

In the Australian context one of these has to do with cricket wickets.

Normally arenas in Australia have dual purposes. During the winter months they are used for playing some code of football. Depending on the geographical areas and other matters, this could be what is known as Australian Rules Football, Rugby League, Rugby Union or Soccer. During the summer months the arenas are used for cricket.

An individual cricket wicket is 22 yards long by about 3 yards wide and is prepared by cutting the turf very short and rolling the area to provide a flat hard surface.

Normally the substrate of a cricket wicket is made of a clay soil which can bind, be rolled, and which does not crack or break away unduly, even though it is used for a number of days, often in very hot weather.

The property of this soil is usually if it is wet it is very sticky, and, in any case, it generally has little porosity.

Thus, during the winter months where football is played on the ground, the players boot-stops tend to churn up the wicket area and it becomes a slushy muddy mess.

Of course the wicket areas are usually in the centre of the ground, where, very often, the alternative sport's play commences. Also during a cricket season it is desirable to use a number of different pitches, because individual pitches can break up substantially after some days play, the wicket area can have a substantial dimension.

By the use of the invention we can provide a cricket pitch in, say two or three lengths and transport these to the site, say, on the back of a truck or the like, keeping in mind that each length may be of the order of thirty feet long and place them in the required position using the method of the invention.

With such a component it may be necessary to provide multiple grabs, and it may also be desirable to grasp the member from the sides as well as the top, at least during initial lifting.

These large components can be directly located into a pre-prepared portion on the arena and a playable pitch can be provided in a relatively short time by cutting the turf and rolling the pitch, as in a manner conventional for cricket pitches.

It can be that during a season there can be replacements of the particular pitch so that the wicket area occupies a smaller portion of the ground than would otherwise be the case, and, of course, play can be closer to the centre of the ground throughout the season. During the winter months it is only necessary that the pitch be removed in its components and the wicket area then returfed using the invention with the slabs having a character effectively identical to that of the remainder of the arena.

Similar applications could be provided in different areas, for example to provide baseball diamonds, pitchers mounds and the base plate in a ground which is otherwise used for different sports. A similar type of arrangement could also be used for athletics fields where running tracks could be incorporated when the field is to be used for track and field events.

Also, if the surface was required for temporary purposes on, say, a square or other flat surface, then the slabs could be laid rapidly and quickly and a surround could be abutted against the exterior slabs and this could be, say, a concrete member which could be laid abutting the exposed surfaces of

the slabs and this could be provided with a number of spaced differently angled apertures therethrough so that rods or the like could be passed into the side of the slab with the rods passing in different sense so as to cause the edge to be locked thereon so there would be minimal damage to the edge whilst ensuring that the arrangement was stable.

The invention is particularly suitable for use in providing a surface equivalent to an adjacent surface in an area where there may be heavy traffic.

We shall describe this in relation to a race course cross over but it will be seen that it can have many other applications. It is of course almost inherent that a race course must have cross overs.

The only alternative is to have a tunnel or tunnels or the like beneath the track. At cross overs there are normally removable fence rails and when the track is not being used for training or racing, vehicles, and often substantially heavy vehicles, tend to cross the track regularly.

This can cause several undesirable features in the track. Firstly it can cause compaction greater than the rest of the track so that there is a substantial difference in "feel" of the track at the cross over than at the rest of the track and there can also be surface variations.

Secondly, and particularly during wet weather, the continual crossing of the track by vehicles can cut up the surface and can substantially change the surface relative to that of the rest of the track.

The invention can be used in situations such as this in two different ways. Basically a solid surface can be provided at a level below the normal level of the track, for example a concrete road or the like could be provided thereacross, and during periods where there is no use of the track by horses the road can simply be exposed, vehicles can travel across it at will and there will be no damage.

When the track is to be used then the slabs of the invention can be placed over this road, which is at a known distance below the required surface of the track and these can normally be located in an overlapping brick like pattern, although they could be located in a side by side relationship.

The width of the road and/or its edging are such as to receive a specific number of the slabs.

Once these have been located, they can, if required, be rolled and the track is then available for use.

These slabs can be specifically formulated and grown to have an effective density and feel similar to the remainder of the

track so that there is no transition apparent to the horses as they race across the crossing. An alternative arrangement is, of course, to leave the turf of the crossing in position, and use the crossing but to replace the slabs either just before race meetings or on a regular basis.

In this way the track can always be in a required condition when a race meeting is being held and it is available for use at other periods although during these there can be some transition between the track proper and the cross over.

It may be desired that when the slabs are being removed, rather than use the underlying area as roadway, that pre-formed blocks, which are of the same size as the slabs, could replace the slabs. This has the advantage that work on the track is not restricted as equipment, such as mowers or rollers can travel across the roadway. Also, it protects the edge of the track.

A similar system could be used in, say, sports arenas where all the working vehicles enter the arena through a single gate so that there may be a tendency for contraction in the turf area round the gate which is not repeated in the rest of the arena.

In such applications, again, the turf can be replaced as required.

1. A turf product being in the form of an extended slab comprising a growing medium of substantial thickness to provide a root zone, the growing medium being sand and/or soil, turf established on the surface of the growing medium and with the roots thereof extending into the root zone characterised in that the combination of the roots and the root zone material and the thickness of the growing medium is such that the slab is consolidated and has a degree of structural rigidity so that it is possible to handle the slab without any form of support of its base.
2. A turf product as claimed in claim 1 wherein there is no support of the side walls of the slab.
3. A turf product as claimed in claim 1 or claim 2 wherein there is a reinforcing material mixed with the sand and/or soil growing medium which reinforcing material, when the roots grow into the root zone, is consolidated into the roots and growing medium whereby structural rigidity is increased.
4. A turf product as claimed in claim 3 wherein the reinforcing material is in the form of plastics mesh elements each small in relation to the product.
5. A turf product as claimed in claim 3 wherein the reinforcing material is in the form of a fibrous

material.

6. A turf product as claimed in any one of the preceding claims wherein the material for the product is grown in a large area and is later harvested and cut into the required sizes.
7. A turf product as claimed in any one of claims 1 to 5 wherein individual slabs are made and are located closely adjacent to similar slabs in an area.
8. A turf product as claimed in claim 7 wherein the individual slabs have an impervious material around their periphery.
9. A turf product as claimed in any one of claims 6 to 8 wherein the material is grown using a perched water table to control the depth of root growth to aid in harvesting.
10. A turf product as claimed in any one of claims 6 to 8 wherein the material is grown having at least one sheet of impervious material at the required depth of the product, which material has apertures therethrough to limited the movement of roots therethrough whilst permitting drainage.
11. A turf product as claimed in claim 10 wherein there are two sheets of impervious material which sheets have

corresponding apertures.

12. A turf product as claimed in either of claims 10 or 11 when appended to claim 9.
13. A turf product as claimed in claim 10 or claim 11 wherein a blade or the like is used to cut any roots extending through the impervious material after part of the product is lifted from the surface on which it has been grown.
14. A method of handling a turf product in the form of a slab as claimed in any preceding claim comprising providing means to apply a lifting force to the upper surface of the slab at at least a number of positions over the area of the surface of the slab which are located so the slab can be lifted without tending to break because of unacceptable forces at any part of the slab to thereby enable movement of the slab as a whole and delivery of the slab to a required position, locating in the required position and removing the lifting forces leaving the slab at the required position.
15. A method as claimed in claim 14 wherein the lifting forces are provided by a grab having at least two members adapted to pass into the product from the top or side thereof at an angle such as to be capable of lifting the product.

16. A method as claimed in claim 15 wherein the grab comprises a frame adapted to be connected to a vehicle and a number of members adapted to pass into the product from the upper surface thereof, the members passing into the product at angles away from the vertical so as to be capable of carrying the weight thereof.
17. A method as claimed in claim 16 wherein there are a plurality of arcuate members which are partially rotatable about axes parallel to the surface of the product and which, on rotation, can enter the body of the product at an angle to the surface thereof and thereby permit handling of the product.
18. A method as claimed in claim 16 wherein the grab comprises a frame adapted for connection to a prime mover and a number of parallel members adapted to pass into the product from the upper surface thereof, the members having means whereby they can be moved from their parallel relationship thus causing a frictional reaction with the slab which is of a magnitude sufficient to permit lifting of the slab.
19. A method of laying a number of turf products as claimed in any one of claims 1 to 13 in an abutting arrangement using the method of any one of claims 14 to 18 including moving a first product to adjacent the required position whilst it is held, locating the product in the position

and releasing the lifting force therefrom and moving and locating further products in an abutting relationship by the use of the method.

20. A method of making a cross-over from turf products as claimed in any one of claims 1 to 13 wherein the position of the cross-over is formed and provided with a base adapted to receive the turf products at a distance below the surround equivalent to the thickness of the turf product, locating the turf products using the method of any one of claims 14 to 19.
21. A method as claimed in claim 20 wherein along two sides of the cross over there are walls against which the turf products abut and at each end there can be stop members to restrain the turf products.
22. A method as claimed in either of claims 20 or 21 wherein when the cross over is to be used, the turf products are removed and replaced by members of effectively the same size and shape thereof.
23. A cross-over made by the method of any of claims 20 to 22.
24. A method of rejuvenating a turfed area comprising removing a worn slab of turf using the method of any one claims 14 to 19 to remove the worn slab and replacing the

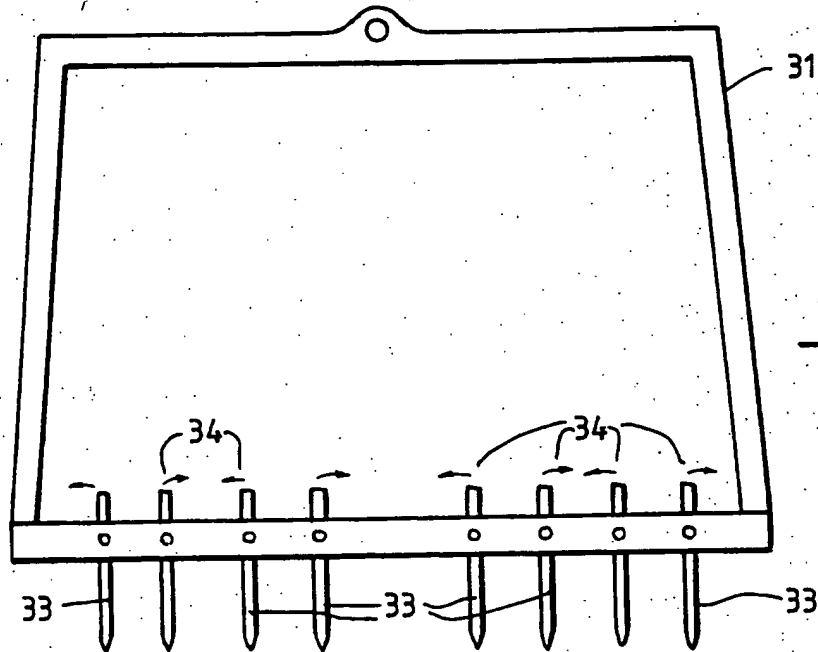
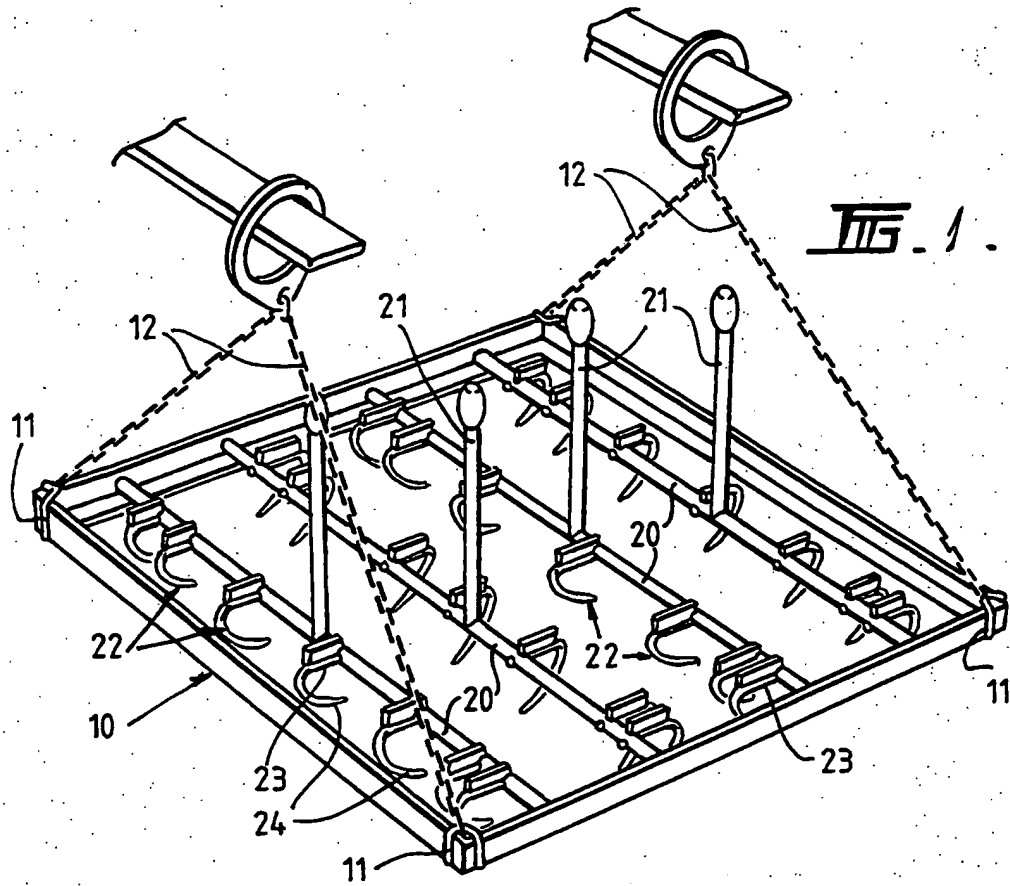
slab with a replacement slab using the method.

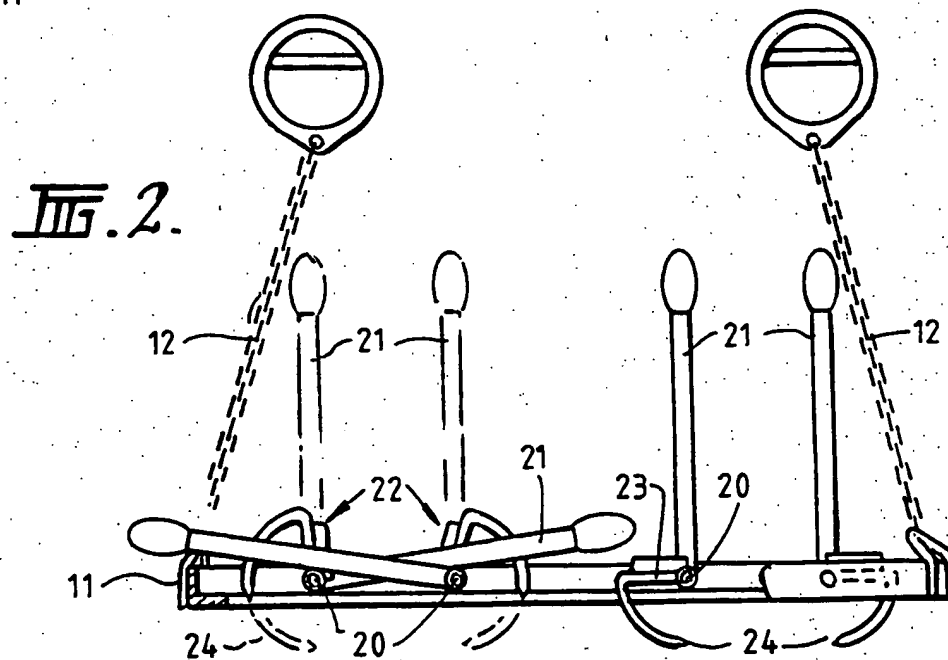
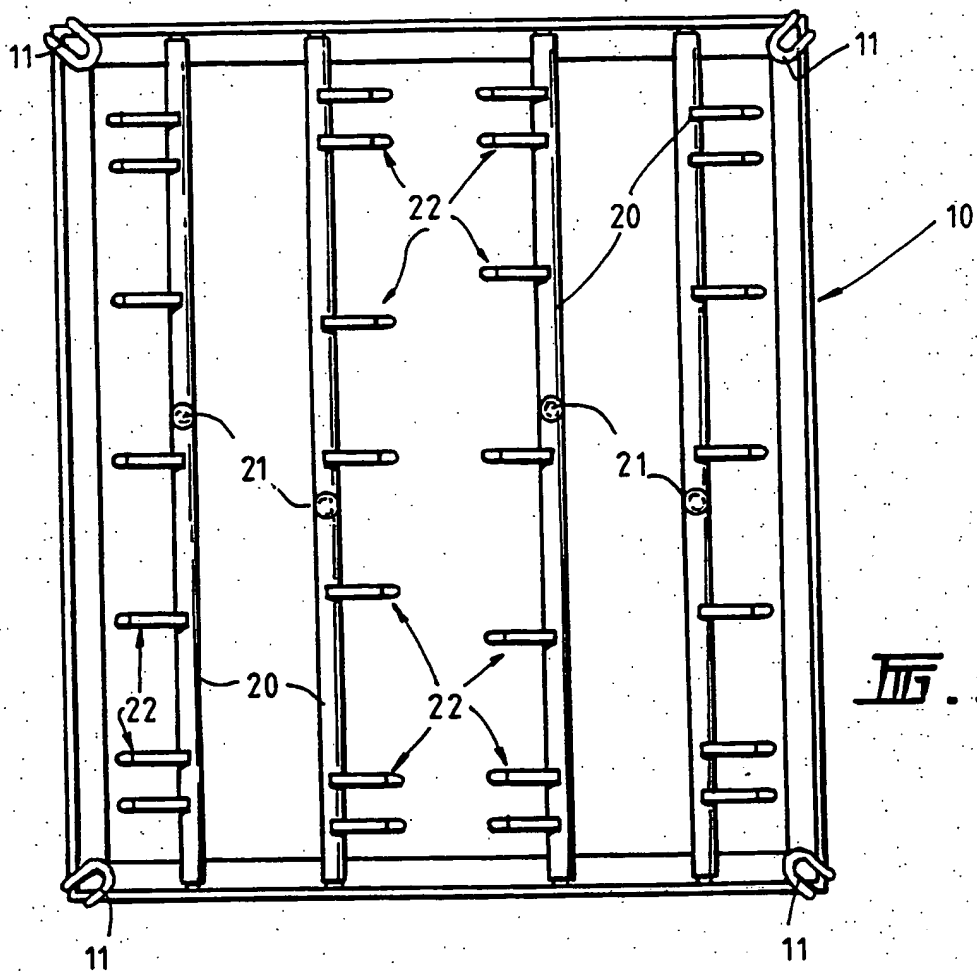
25. A method of rejuvenating a turfed area as claimed in claim 24 wherein the replacement slab is obtained from the same area and is itself replaced by the worn slab.
26. A method of placing at least one slab in a turfed area which slab is of a type different to that of the turfed area comprising removing from the area turf corresponding in shape to the replacement slab or slabs and incorporating the replacement slab or slabs using the method of any one of claims 14 to 19.
27. A method as claimed in claim 26 wherein the different type slab is a turf product as claimed in any one of claims 1 to 14 in which the growing medium is soil and wherein the slab is adapted to form part of a cricket pitch.
28. A method as claimed in claim 27 wherein there are at least two slabs of different material which together make the whole or the required part of the cricket pitch.
29. A tool for moving turf product as claimed in any one of claims 1 to 14 being a grab adapted to be mounted on a boom or the like extending from a vehicle and having a frame and at least two members associated therewith and adapted to pass into the product from the top or side

thereof at an angle such as to be capable of lifting the product.

30. A tool as claimed in claim 29 wherein the grab comprises a frame adapted to be connected to a vehicle and a number of members adapted to pass through the frame and into the product from the upper surface thereof, the members passing into the product at angles away from the vertical so as to be capable of carrying the weight thereof.
31. A tool as claimed in claim 29 wherein there are a plurality of arcuate members which are partially rotatable about axes parallel to the surface of the product and which, on rotation, can enter the body of the product at an angle to the surface thereof with little disturbance to the product and thereby permit handling of the product.
32. A tool as claimed in claim 31 wherein the arcuate members are connected to straight members attached at the pivot point and having a length equal to the radius of the arcuate members.
33. A tool as claimed in claim 31 or claim 32 wherein the rotation of the rotatable members is effected mechanically or hydraulically.
34. A tool as claimed in claim 29 having at least two members

which are adapted to be driven into the body of the product in a substantially parallel relationship and wherein means are provided to move the members away from this relationship to apply a force to the product sufficient to enable it to be lifted.





INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 95/00018

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁶ A01G 1/12, A01B 45/04, E01C 13/00, A63C 19/00, A63K 1/00 According to International Patent Classification (IPC) or to both national classification and IPC																						
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: A01G 1/12, A01B 45/04, E01C 13/00, A63C 19/00, A63K 1/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU:IPC as above Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.																				
E	AU, A, 53668/94 (STRATHAYR INSTANT LAWN PTY LTD) 11 May 1994 (11.05.94) whole specification	1																				
A	AU, A, 88464/91 (THE GREENWAY SERVICES INC) 16 April 1992 (16.04.92) whole specification	1																				
A	GB, A, 2138690 (MADDEN) 31 October 1984 (31.10.84) whole specification	1																				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.																						
* Special categories of cited documents : <table border="0"> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention</td> </tr> <tr> <td>"E"</td> <td>earlier document but published on or after the international filing date</td> <td>"X"</td> <td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L"</td> <td>document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y"</td> <td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention	"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family	"P"	document published prior to the international filing date but later than the priority date claimed		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention																			
"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																			
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																			
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family																			
"P"	document published prior to the international filing date but later than the priority date claimed																					
Date of the actual completion of the international search 6 March 1995 (06.03.95)		Date of mailing of the international search report 30 Mar 1995 (30.03.95)																				
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer GM COX Telephone No. (06) 2832484																				

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 95/00018

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	PATENT ABSTRACTS OF JAPAN, M-1293, page 8, JP, A, 4-118403 (HIROKI) 20 April 1992 (20. 04.92) abstract	1
X	US, A, 3901324 (FISHER) 26 August 1975 (26.08.75) whole specification	1-34
X	US, A, 4294316 (HEDLEY) 13 October 1981 (13.10.81) whole specification	1-34
X	AU, A, 31193/89 (SCHIRMER) 14 September 1989 (14.09.89) whole specification	1-34
X	US, A, 3112136 (HAMMOND) 26 November 1963 (26.11.63) whole specification	1-34
X	US, A, 2962177 (PRIDGEON) 29 November 1960 (29.11.60) whole specification	1-34
X	GB, A, 2009096 (HOLMES) 13 June 1979 (13.06.79) whole specification	1-34
X	GB, A 2011346 (WILLIAM COOK ENGINEERS) 11 July 1979 (11.07.79) whole specification	1-34
X	US, A, 3876093 (CARRIERE) 8 April 1975 (08.04.75) whole specification	1-34

INTERNATIONAL SEARCH REPORT

International application No.

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Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1 to 13 are directed to a turf product in which its structural rigidity form the "first technical feature".

Claims 14 to 18, 29-34 relate to a method and a tool for moving the turf product in which the means lift the turf product form the second "technical feature".

Claims 19 and 28 are directed to a variety of methods using the turf product of claims 1 to 13 and/or method of claims 14 to 18.

Therefore, as none of these groups of claims share either of the technical features noted above, a "technical relationship" between the invention, as defined in the PCT rule 13.2 does not exist. Accordingly, the international application does not relate to one invention or to a single inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

PCT/ AU 95/00018

Patent Document Cited in Search Report		Patent Family Member					
AU	53668/94	WO	9409613				
AU	88464/91	EP	555308	US	5187894	WO	9205690
US	4294316						
US	3901324						
AU	31193/89						
GB	2009096						
GB	2011346						
GB	3876093						
END OF ANNEX							